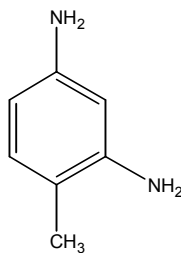


2,4-DIAMINOTOLUENE

CAS No. 95-80-7

First Listed in the *Second Annual Report on Carcinogens*



CARCINOGENICITY

2,4-Diaminotoluene is *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC V.16, 1978; NCI 162, 1979; IARC V.39, 1986). When administered in the diet, 2,4-diaminotoluene induced hepatocellular carcinomas or neoplastic nodules in rats of both sexes and fibromas of the subcutaneous tissue in male rats and increased the incidence of carcinomas or adenomas of the mammary gland in female rats. When administered in the diet, 2,4-diaminotoluene induced hepatocellular carcinomas and may have increased the incidence of lymphomas in female mice. No tumors occurred at significantly increased incidences in male mice. When injected subcutaneously, the compound induced local sarcomas in rats of both sexes.

There are no adequate data available to evaluate the carcinogenicity of 2,4-diaminotoluene in humans (IARC V.16, 1978).

PROPERTIES

2,4-Diaminotoluene is a crystalline solid that is very soluble in hot water, ethanol, ether, and hot benzene. When heated to decomposition, it emits toxic fumes of nitrogen oxides (NO_x). 2,4-Diaminotoluene is available in the United States as a commercial grade; however, most of this chemical is used as an intermediate without isolation and is usually produced as part of a mixture of about 80% 2,4- and 20% 2,6-diaminotoluene. It is also produced in smaller amounts as part of a mixture containing about 65% 2,4- and 35% 2,6-diaminotoluene.

USE

The primary use of 2,4-diaminotoluene is as an intermediate in the production of toluene diisocyanate, which is used to produce polyurethane. Small amounts of 2,4-diaminotoluene are used to produce dyes for textiles, leathers, furs, and wood and biological stains. 2,4-Diaminotoluene can be used in the production of about 60 dyes, 28 of which are currently believed to be of commercial world significance. The following eight dyes, believed to be produced commercially from 2,4-diaminotoluene, were produced in the United States in 1975: C.I. Basic Brown 4, Basic Orange 1, Direct Brown 154, Direct Black 4, Direct Black 9, Leuco Sulfur Brown 10, Leuco Sulfur Brown 26, and Sulfur Black 2. These dyes are generally used to color silk, wool, paper, and leather. Some are also used to dye cotton bast fibers and cellulosic

fibers, in spirit varnishes and wood stains, as indicators in the manufacture of pigments, and as biological stains (IARC V.16, 1978).

2,4-Diaminotoluene is used as a developer for direct dyes, particularly to obtain black, dark-blue, and brown shades, and to obtain navy-blue and black colors on leather. It is also used in dyeing furs. In the United States, 2,4-diaminotoluene was used in hair dye formulations to produce drab-brown, drab-blond, blue, and grey shades on the hair. This use was forbidden in 1971 (IARC V.16, 1978).

Other applications include its use for the preparation of impact resins, polyimides with superior wire coating properties, antioxidants, hydraulic fluids, polyurethane foams, and fungicide stabilizers (HSDB, 1997).

PRODUCTION

Chemycyclopedia 98 identifies one U.S. supplier of 2,4-diaminotoluene, and the 1998 Chemical Buyers Directory provides the names of two such companies (Rodnan, 1997; Tilton, 1997). The 1997 Directory of Chemical Producers lists three producers of the compound, but no volumes are reported (SRIa, 1997). In 1994 three companies produced 387 million lb of the compound (USITC, 1995). For previous years, production volumes of 2,4-diaminotoluene were not disclosed, but the USITC did identify three domestic producers of the compound from 1985 through 1987 and two manufacturers up until 1992 (USITC, 1986-1991, 1993-1994). Total U.S. production of 2,4-diaminotoluene in 1984 exceeded 186 million lb, which was less than the 1983 production of 202 million lb (USITC, 1985, 1984). Domestic production of 2,4-diaminotoluene totaled 162 million lb in 1982 and 205 million lb in 1981 (USITC, 1983, 1982). In 1980, 243 million lb were produced (USITC, 1981). The 1979 TSCA Inventory identified eight companies producing more than 240 million lb of 2,4-diaminotoluene and three companies importing 5,500 lb in 1977. The CBI Aggregate was less than 1 million lb (TSCA, 1979). No data on imports or exports were available. 2,4-Diaminotoluene has been produced commercially in the United States for over 50 years (IARC V.16, 1978).

EXPOSURE

The primary routes of potential human exposure to 2,4-diaminotoluene are dermal contact and, less frequently, inhalation. The National Occupational Exposure Survey (1981-1983) indicated that 8,513 workers, including 395 women, were potentially exposed to 2,4-diaminotoluene (NIOSH, 1988). This estimate was derived from observations of the actual use of the compound (2% of total observations) and the use of tradename products known to contain the compound (98%). Despite a long high-volume production history, potential exposure to 2,4-diaminotoluene is minimal because more than 99% of the 2,4-diaminotoluene produced in the United States is used captively to produce toluene diisocyanate, usually at the same site. Air emissions from production are believed to be insignificant, but the water solubility of the chemical may result in the contamination of industrial wastewater discharges and possibly exposure of the general population. The Toxic Chemical Release Inventory (EPA), however, reported that a total of 1,575 lb of 2,4-diaminotoluene was released to the environment, only to the atmosphere, from one facility that produced, processed, or otherwise used the chemical. The facility, located in Pasadena, Texas, was reporting under the industrial classifications for manufacture of industrial organic chemicals not elsewhere classified (SIC Code 2869) and industrial inorganic chemicals (SIC Code 2819) (TRI96, 1998).

Potential consumer exposure may occur as a result of the presence of trace contaminants in products that contain 2,4-diaminotoluene-based dyes (e.g., furs, leather, silk, textiles, and wool) (IARC V.16, 1978). Furthermore, the compound is a degradation product of the polyester urethane foam used in Meme silicone breast implants (Luu et al., 1998), which may be a growing cause for concern since the surgical procedure is quite common in today's society. Elevated levels were detected in the urine and plasma of all patients up to two years post-operation; the levels in the latter ranged from 0.4 to 6 ng/mL. This finding indicates the continued degradation of the polyurethane layer and thus presents an "unreasonable" health risk to the patients (Sepai et al., 1995; Luu et al., 1998).

REGULATIONS

According to CPSC, residual traces of 2,4-diaminotoluene may be present in some dyes based on the chemical and in the final consumer products. The presence of 2,4-diaminotoluene, even as a trace contaminant, may be a cause for concern. However, data describing the actual levels of impurities in the final product and the potential for consumer exposure are currently lacking. EPA regulates 2,4-diaminotoluene under the Clean Air Act (CAA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Superfund Amendments and Reauthorization Act (SARA), and Toxic Substances Control Act (TSCA). The National Emission Standards for Hazardous Air Pollutants (NESHAP) regulates 2,4-diaminotoluene emissions from processing facilities under CAA. EPA has established a reportable quantity (RQ) of 10 lb under CERCLA. RCRA subjects wastes containing 2,4-diaminotoluene to handling and report/recordkeeping requirements. EPA has included 2,4-diaminotoluene on a list of priority hazardous substances under SARA. Manufacturers, importers, and processors of 2,4-diaminotoluene are required to submit to EPA copies and lists of unpublished health and safety studies under TSCA. FDA requires the use of warning labels on coal tar hair dyes containing 2,4-diaminotoluene under the Food, Drug, and Cosmetic Act (FD&CA). 2,4-Diaminotoluene is a hydrolysis product of polyurethane adhesives and of toluene diisocyanate, an adhesive component. The authorization for use of these urethane adhesives is being deferred pending evaluation of the potential for 2,4-diaminotoluene to migrate into food. OSHA regulates 2,4-diaminotoluene under the Hazard Communication Standard and as a chemical hazard in laboratories. Regulations are summarized in Volume II, Table B-36.